

reactor used for the methanol synthesis step in the present invention.

Fig. 2 is a drawing showing the process flow of the methanol production plant according to the present invention.

5 Fig. 3 is a drawing showing the temperature distribution of the catalyst layer in the reactor.

The reference numerals shown in these figures are defined as follows: 1, Reactor; 2, Casing; 3, Reaction tube; 4a, 4b, Tube plates; 5, Plug; 6, [6a.] Inner tubes; 7, Central tube; 8, Circular duct; 9, Shielding plate; 10, Unreacted gas; 11, Inlet of catalyst layer; 12, Unreacted gas-feeding room; 13, Circular catalyst layer; 14, Unreacted feed gas nozzle; 15, Outlet of catalyst layer; 16, Lower collecting room; 17, Outlet nozzle of reactor; 18, Resulting gas; 19, Boiling liquid; 20, Inlet nozzle; 21, Outlet nozzle; 22, 23, Distillation columns; M, Synthetic gas (raw material gas); R, Recycle gas.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The embodiment of the present invention shall be explained with reference to attached drawings.

20 The schematic structure of the reactor used in the methanol synthesis step in the embodiment of the present invention is shown in Fig. 1.

The methanol production process of the present invention comprises a synthetic gas production step in which hydrocarbon  
25 is reacted with steam to generate synthetic gas comprising main

reactor used for the methanol synthesis step in the present invention.

Fig. 2 is a drawing showing the process flow of the methanol production plant according to the present invention.

5 Fig. 3 is a drawing showing the temperature distribution of the catalyst layer in the reactor.

The reference numerals shown in these figures are defined as follows: 1, Reactor; 2, Casing; 3, Reaction tube; 4a, 4b, Tube plates; 5, Plug; 6, Inner tubes; 7, Central tube; 8, Circular duct; 9, Shielding plate; 10, Unreacted gas; 11, Inlet of catalyst layer; 12, Unreacted gas-feeding room; 13, Circular catalyst layer; 14, Unreacted feed gas nozzle; 15, Outlet of catalyst layer; 16, Lower collecting room; 17, Outlet nozzle of reactor; 18, Resulting gas; 19, Boiling liquid; 20, Inlet nozzle; 21, Outlet nozzle; 22, 23, Distillation columns; M, Synthetic gas (raw material gas); R, Recycle gas.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The embodiment of the present invention shall be explained with reference to attached drawings.

20 The schematic structure of the reactor used in the methanol synthesis step in the embodiment of the present invention is shown in Fig. 1.

The methanol production process of the present invention comprises a synthetic gas production step in which hydrocarbon  
25 is reacted with steam to generate synthetic gas comprising main

Further, the central tube 7 disposed almost in the center of the inner tube 6 is installed almost in the center of a wholly or partially detachable shielding plate 9 disposed at the upper end of the reaction tube. The lower end of this central tube 7 is preferably in a position which is farther by  $1/10$  to  $2/3$  of the length of the reaction tube from the upper end of the reaction tube.

Provided are an unreacted gas-feeding room 12 at the upper part of the reaction tube 3 in the reactor 1 and a lower collecting room 16 for reaction gas at the lower part of the reaction tube 3.

In such reactor 1, unreacted gas 10 produced in the synthetic gas production step of the present invention is introduced into the reactor 1 from a feed gas nozzle 14 at the upper part of the reactor. The unreacted gas flows downwards from the upper part of the central tube 7 through the inlet <sup>B</sup><sub>A</sub> of the central tube 7 partitioned by a shielding plate 9 from the unreacted gas-feeding room 12 to flow into the inner tube 6 from the lower outlet of the central tube 7.

Then, the unreacted gas flows upwards through a circular duct 8 surrounded by the inner tube 6 and the central tube 7 to reach the upper end of the circular catalyst layer 13. When the unreacted gas flows downwards through the circular catalyst layer 13 surrounded by the reaction tube 3 and the inner tube 6, the synthesis reaction of methanol goes on to generate heat in the

Further, the central tube 7 disposed almost in the center of the inner tube 6 is installed almost in the center of a wholly or partially detachable shielding plate 9 disposed at the upper end of the reaction tube. The lower end of this central tube 7 is preferably in a position which is farther by  $1/10$  to  $2/3$  of the length of the reaction tube from the upper end of the reaction tube.

Provided are an unreacted gas-feeding room 12 at the upper part of the reaction tube 3 in the reactor 1 and a lower collecting room 16 for reaction gas at the lower part of the reaction tube 3.

In such reactor 1, unreacted gas 10 produced in the synthetic gas production step of the present invention is introduced into the reactor 1 from a feed gas nozzle 14 at the upper part of the reactor. The unreacted gas flows downwards from the upper part of the central tube 7 through the inlet B at the central tube 7 partitioned by a shielding plate 9 from the unreacted gas-feeding room 12 to flow into the inner tube 6 from the lower outlet of the central tube 7.

Then, the unreacted gas flows upwards through a circular duct 8 surrounded by the inner tube 6 and the central tube 7 to reach the upper end of the circular catalyst layer 13. When the unreacted gas flows downwards through the circular catalyst layer 13 surrounded by the reaction tube 3 and the inner tube 6, the synthesis reaction of methanol goes on to generate heat in the